

Claims:

1. A method of estimating frequency offset, comprising the steps of:
receiving a sequence of signal samples which are complex numbers;
5 delaying said signal samples by a first delay value;
performing multiplication between each said signal sample and a complex
conjugate of each said delayed signal sample to generate a first value;
delaying each said first value by a second delay value;
accumulating said first value to generate a second value;
10 subtracting each said delayed first value from said second value to generate a
third value; and
generating said estimated frequency offset based on said third value.
2. A method of claim 1, wherein said second delay value is larger than said first
delay value.
- 15 3. A method of estimating frequency offset in a receiver, comprising the steps
of:
receiving a first portion of signal samples which are complex numbers;
receiving a first control signal;
deriving a first frequency offset estimation based on said first portion of signal
20 samples;
receiving a second portion of signal samples which follows said first portion of
signal samples;
compensating said second portion of signal samples by utilizing said first
frequency offset estimation so as to generate a compensated second portion
25 of signal samples;
deriving a second frequency offset estimation based on said compensated second
portion of signal samples; and
obtaining a total frequency offset estimation based on said first frequency offset
estimation and said second frequency offset estimation.
- 30 4. A method of claim 3, wherein the first frequency offset estimation keeps constant
after said first control signal is active.
5. A method of claim 3, wherein the step of deriving said first frequency offset

estimation comprises the steps of:

delaying said first portion of signal samples by a first delay value;

performing multiplication between each said signal sample and a complex conjugate of each said delayed signal sample to generate a first value;

5 delaying each said first value by a second delay value;

accumulating said first value to generate a second value;

subtracting each said delayed first value from said second value to generate a third value; and

generating said estimated frequency offset based on said third value.

10 6. A method of claim 5, wherein said second delay value is larger than said first delay value.

7. A method of claim 3, wherein the step of deriving a second frequency offset estimation comprising the steps of:

15 delaying each of said partial compensated second portion of signal samples by a third delay value;

performing multiplication between each said partial compensated signal sample and a complex conjugate of each said delayed partial compensated signal sample to generate a fourth value;

accumulating said fourth value to generate a fifth value;

20 generating said second frequency offset estimation based on said fifth value.

8. A device of estimating frequency offset in a receiver receiving an analog signal, said device comprising:

an analog-to-digital converter for converting said received analog signal to a sequence of sampled elements;

25 a first storing means having M elements that sequentially stores said sampled elements, for delaying each said sampled elements by M samples to generate a delayed sampled element;

a multiplication means for performing multiplication between a complex conjugate of said delayed sampled element and a current sampled element;

30 a second storing means having N elements that sequentially stores an output of said multiplication means, for delaying each said output of said multiplication means by N samples;

- an accumulating means for accumulating said output of said multiplication means; and
- a subtracting means for sequentially subtracting output of said second storing means from output of said accumulating means;
- 5 an estimating means for generating said estimated frequency offset based on an output of said subtracting means.
9. A device of claim 8, wherein the value of N is larger than the value of M .
10. A device of estimating frequency offset in a receiver receiving an analog signal and converting said analog signal to a series of signal samples which are complex number, said device comprising:
- 10 first deriving means for deriving a first frequency offset estimation based on a first portion of said signal samples;
- compensating means for compensating a frequency offset of a second portion of said signal samples which follows said first portion of signal samples by utilizing said first frequency offset estimation so as to generate a compensated second portion of signal samples;
- 15 second deriving means for deriving a second frequency offset estimation based on said compensated second portion of signal samples;
- estimating means for computing a total frequency offset estimation based on said first frequency offset estimation and said second frequency offset estimation.
- 20 11. A device of claim 10, wherein the device further receives a first control signal, and said first frequency offset estimation keeps constant after said first control signal is active.
- 25 12. A device of claim 10, wherein the device further receives a second control signal, and said second frequency offset estimation keeps constant after said second control signal is active.
13. A device of claim 10, wherein said first deriving means for deriving a first frequency offset estimation comprising:
- 30 a first delaying unit having M elements for delaying each of said first portion of signal samples by M samples to generate a delayed signal sample;
- a multiplication unit for performing multiplication between each said signal sample and a complex conjugate of each said delayed signal sample to generate a first value;

- a second delaying unit having N elements for delaying each said first value by N samples to generate a delayed first value;
- an accumulating unit for accumulating said first value to generate a second value;
- 5 a subtracting unit for sequentially subtracting each said delayed first value from said second value to generate a third value; and
- an estimating unit for computing said first frequency offset estimation based on said third value.
14. A device of claim 13, wherein the value of N is larger than the value of M .
- 10 15. A method of claim 10, wherein said deriving means for deriving a second frequency offset estimation comprising:
- a delaying unit for delaying each of said partial compensated second portion of signal samples;
- 15 a multiplication unit for performing multiplication between each said partial compensated signal sample and a complex conjugate of each said delayed partial compensated signal sample to generate a fourth value;
- an accumulating unit for accumulating said fourth value to generate a fifth value; and
- 20 an estimating unit for computing said second frequency offset estimation based on said fifth value.